Explanation of Significant Difference for the Monticello Mill Tailings (USDOE) Site Operable Unit III, Surface Water and Ground Water, Monticello, Utah

1.0 Introduction

The U.S. Department of Energy (DOE) has prepared this Explanation of Significant Difference (ESD) to provide the rationale for evaluating changes to the selected remedy for Operable Unit (OU) III, Surface Water and Ground Water, Monticello Mill Tailings (USDOE) Site (MMTS), in Monticello, Utah. The MMTS, added to the National Priorities List in 1989, is located in southeast Utah, in and near the city of Monticello in San Juan County. OU III encompasses ground water and surface water at and hydraulically downgradient of the Monticello mill site, a former uranium and vanadium ore-processing site.

DOE is the lead agency responsible for the Monticello cleanup project activities. The cleanup is being conducted pursuant to a Federal Facility Agreement between the U.S. Environmental Protection Agency (EPA), DOE, and the Utah Department of Environmental Quality (UDEQ) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund. DOE signed a Record of Decision (ROD) selecting a remedy for OU III in May of 2004 and received concurrence from EPA Region 8 and UDEQ in June of that year.

This ESD describes the implementation of the contingency plan as specified in the 2004 ROD. Section 117(c) of CERCLA, 42 *United States Code* Section 9617(c), and the National Contingency Plan (NCP), Title 40 *Code of Federal Regulations* (CFR) Part 300.435(c)(2)(i), require that an ESD be prepared when the differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost. An ESD is warranted for the OU III ROD to inform and document to affected parties that, because the selected remedy has not met specific performance criteria, a contingency remedy is being implemented that includes:

- A pump-and-treat enhancement that treats contaminated ground water upgradient of a funnel and gate permeable reactive barrier (PRB) treatment wall;
- Removal of the PRB gate and replacement of the gate with a containment system that allows for continued treatment of the contaminant plume;
- Further studies to be conducted during the current CERCLA 5-year review period to determine whether the contingency remedy of pump-and-treat enhancement, together with monitored natural attenuation (MNA), is a viable remedy at the surface water and ground water operable unit; and
- Inclusion and evaluation of the recently promulgated maximum contaminant level (MCL) for uranium in surface water as a remedial action objective at the surface water and ground water operable unit.

This ESD is supported by and will become part of the Administrative Record file for the site, in accordance with the NCP, Section 300.825(a)(2). The Administrative Record is available for review at the site information repositories located at the DOE Office of Legacy Management, 2597 B ¾ Road, Grand Junction, Colorado 81503, and the DOE Monticello Field Office,

1665 S. Main Street, Monticello, Utah 84535. Key regulatory documents for the MMTS are available on DOE's Legacy Management website at http://www.lm.doe.gov/land/sites/ut/monticello/monticello.htm. The public and interested parties can obtain additional information by calling Ms. Jalena Dayvault at the Grand Junction Office of Legacy Management at (970) 248-6016 or by calling DOE's toll free number: 1-877-695-5322.

2.0 Site History, Contamination, and Selected Remedy

2.1 Site History

The MMTS has been owned by DOE or its predecessor agencies since the early 1940s. The Vanadium Corporation of America (VCA) constructed the mill in 1942 with funds from the Defense Plant Corporation. Initially, the mill was built to produce vanadium, a metal used for hardening steel needed for World War II. However, with the scale-up of the nuclear weapons program in 1943, the mill began processing a uranium-vanadium sludge for the Manhattan Engineer District. VCA milling operations ceased in 1944. The mill operated intermittently under a lease agreement from 1944 to 1948, continuing the production of uranium-vanadium sludge for the Manhattan Engineer District. The U.S. Atomic Energy Commission purchased the mill in 1948, and operations continued until 1960 when the mill was permanently closed.

OU III is one of three operable units at the MMTS and addresses surface water and ground water contamination that resulted from past operations at the former mill site. A ROD was signed for OU I (the mill site) and OU II (peripheral properties adjacent to the mill site) in 1990 stipulating that contaminated materials from OU I and OU II would be excavated and placed in an on-site repository. Excavation of contaminated soils and sediment for remediation of OU I and OU II was completed in August 1999, and restoration of the mill site was completed in August 2001. OU II properties without soil or ground water contamination were removed from the National Priorities List in October 2003. Mill tailings piles and contaminated soils and sediments associated with OU I and OU II were the primary sources of OU III surface water and ground water contamination. The ROD for OU I and OU II also stipulated that a ROD for a permanent remedy for OU III would be prepared when sufficient data were gathered and presented in a focused Remedial Investigation and Feasibility Study.

A Remedial Investigation report for OU III was prepared and finalized in 1998. In addition to surface water and ground water, the Remedial Investigation report addressed contaminated soils and sediments along Montezuma Creek. DOE, EPA, and UDEQ jointly agreed during preparation of the draft Feasibility Study for OU III in summer 1997 that it was not possible at that time to definitively predict the effects of mill site remediation on the ground water and surface water systems. Therefore, potential risks associated with these media could not be accurately assessed. To address these uncertainties, a decision was made to conduct an Interim Remedial Action (IRA) and complete the Feasibility Study at a later date. In September 1998, DOE signed, EPA approved, and UDEQ concurred in an IRA ROD for OU III.

Soil and sediments originally included as part of OU III were remediated as a non-time-critical removal action, were disposed of in the on-site repository, and were documented as part of OU II remedial activities. In accordance with the provisions of 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," some soil and sediment contamination was left within the Montezuma Creek floodplain. The residual soil and

sediment does not pose an unacceptable threat to human health and the environment; however, it contributes to surface water and ground water contamination.

Subsequent to the removal of the tailings piles and the contaminated debris and materials from the former mill site and the peripheral properties to the on-site repository in 1999 and 2000, DOE conducted a Remedial Investigation Addendum/Focused Feasibility Study. The purpose of the study was to evaluate permanent remediation alternatives for ground water and surface water. Following completion of that document in 2003, a final remedy, consistent with the activities conducted in the IRA, was selected for OU III. DOE completed the ROD in May 2004, and EPA and UDEQ gave their concurrence in June 2004.

2.2 Contamination

Previous investigations, including the Remedial Investigation for OU I and OU II, have shown that the primary source of ground water contamination associated with OU III was the former mill tailings piles on the mill site (OU I). Contaminated soils and sediments in the floodplain of Montezuma Creek downstream from the mill site may have been a secondary source of ground water contamination. Excavation and disposal of the mill tailings piles and associated debris from the former mill site and removal of some of the contaminated soils and sediments from the floodplain of Montezuma Creek removed the primary source and some of the secondary source material that contributed to surface water and ground water contamination. Only the uppermost (alluvial) aquifer at the site has been affected by site-related contamination. OU III contaminants of concern (COCs) and the corresponding remediation goals and rationale for ground water and surface water are presented in Table 1. Gross beta does not have a remediation goal because there is no activity-based standard for this measurement, and risk factors to derive a risk-based goal are radioisotope-specific.

Table 1. OU III Contaminants of Concern and Water Quality Remediation Goals

COC[a]	Ground Water Remediation Goal[a,b]	Surface Water Remediation Goal[a,c]
Arsenic	10 µg/L[d]	10 µg/L
Manganese	880 µg/L[e]	—
Molybdenum	100 µg/L[f]	—
Nitrate (as N)	10,000 µg/L[d]	4,000 µg/L
Selenium	50 µg/L[d]	5 µg/L
Uranium—metal toxicity	30 µg/L[d]	30 µg/L[i]
Vanadium	330 µg/L[e]	—
Uranium-234/238—radiological dose	30 pCi/L[f]	—
Gross alpha activity	15 pCi/L[d,g]	15 pCi/L[h]
Gross beta activity	—	—

[a]Source: *Record of Decision for the Monticello Mill Tailings (USDOE) Site Operable Unit III, Surface Water and Ground Water, Monticello, Utah,* May 2004.
[b]µg/L = micrograms per liter; pCi/L = picocuries per liter.
[c]State of Utah standard for surface water.
[d]EPA maximum contaminant level.
[e]Based on OU III human health risk assessment.
[f]40 CFR 192 maximum concentration limit.
[g]Excluding uranium and radon.
[h]Excluding uranium and radon for MMTS OU III.
[i]State of Utah standard promulgated after the ROD was signed; Rule # R317-2-14 was enacted 6/1/2005, and a notice of continuation was issued 10/2/2007.

Locations where surface water contaminant concentrations exceed standards for drinking water or aquatic criteria are fairly limited. In most cases, the highest concentrations of COCs were detected in samples from seep locations on the former mill site. The completion of surface soil remediation and the IRA for surface water and ground water appear to have resulted in decreased concentrations of most constituents in surface water, with the exception of selenium. Uranium concentrations have occasionally exceeded the 30 µg/L standard in surface water downgradient of the contaminated ground water plume. Increasing the number of monitoring locations will assist in evaluating the surface water standard at OU III for the next CERCLA 5-year review in 2012.

Figure 1 indicates the approximate extent of the contaminant plume based on the distribution of uranium. Plumes for other constituents are much less extensive. With few exceptions (principally uranium), only wells hydraulically upgradient of the PRB have COC concentrations that exceed established standards or benchmarks. Uranium is the most pervasive site-related contaminant and is the primary COC. In addition, uranium is the indicator for determining restoration performance.

Ecological COCs for the site include arsenic, molybdenum, nitrate, selenium, uranium, and vanadium. Selenium is of particular concern because of its tendency to bioaccumulate and because it has recently shown an increase in concentration at some surface water and ground water locations. Selenium is naturally occurring within local bedrock formations and may be accumulating in constructed wetlands within OU III.

2.3 Selected Remedy

All work elements of the IRA ROD for OU III were completed by May 2004 (in R*emedial Action Report for the Interim Remedial Action Record of Decision, Operable Unit III, Surface Water and Ground Water, Monticello Mill Tailings (USDOE) Site, Monticello, Utah,* September 2004). Currently, the remedy for ground water and surface water contamination is MNA with institutional controls as selected by the May 2004 ROD for OU III (*Record of Decision for the Monticello Mill Tailings [USDOE] Site Operable Unit III, Surface Water and Ground Water, Monticello, Utah*). The selected remedy as specified in the Declaration of the ROD is as follows:

- MNA, including comprehensive monitoring to evaluate its effectiveness. Specifically included as part of MNA is an evaluation of selenium concentration trends and the potential impacts of selenium concentrations on ecological receptors.
- Continued implementation and enforcement of the institutional controls that restrict use of the contaminated shallow alluvial aquifer and the restrictive easement that prohibits removal of contaminated sediments from the Montezuma Creek floodplain.
- Removal of the PRB, which was constructed as a full-scale treatability study during the IRA, when the PRB ceases to be effective in removing contaminants from the ground water.

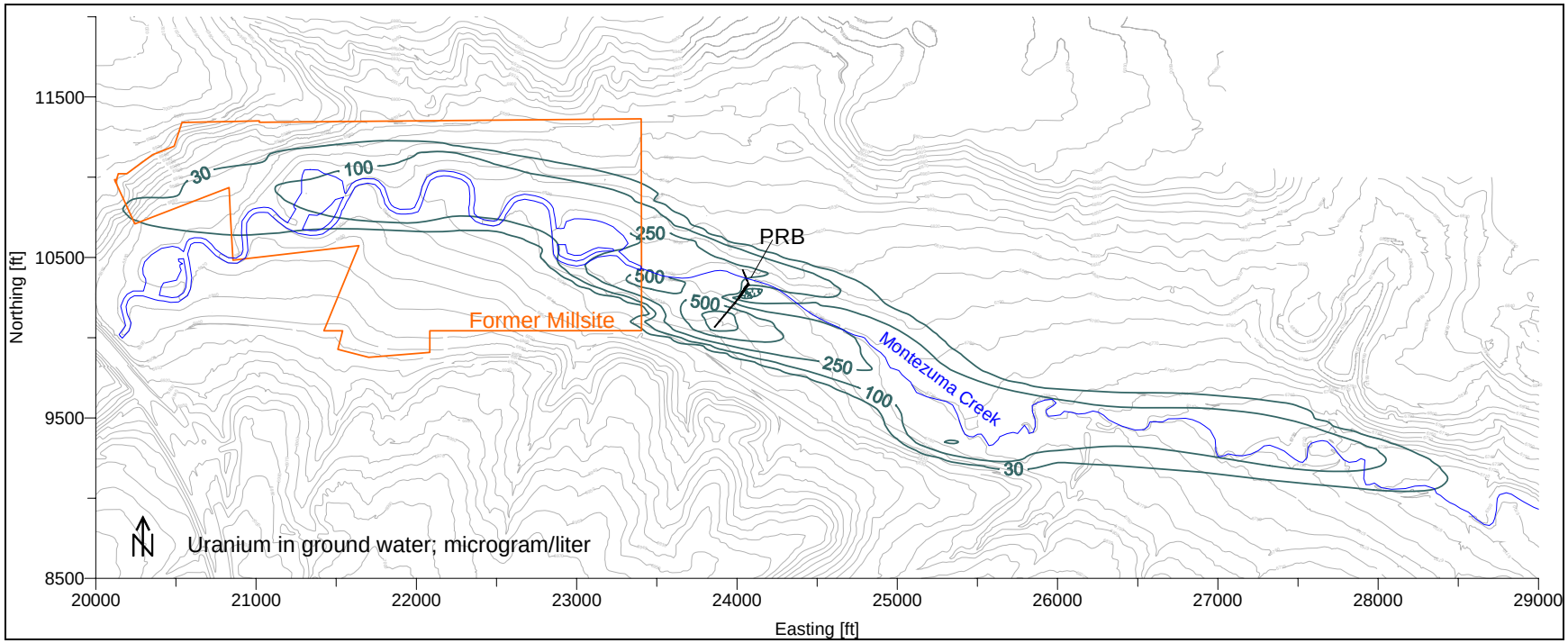

Figure 1. Approximate Extent of the Contaminant Plume Based on Distribution of Uranium, October 2007

These activities will be continued until the remediation goals are met. If the selected remedy does not remain protective of human health and the environment, or if results of the monitoring program do not indicate that the remediation goals can be achieved within 42 years, contingency remedies will be evaluated and will be implemented if determined necessary.

MNA performance issues are addressed in accordance with EPA guidance, which recommends that a contingency remedy be a component of the ROD when MNA is the selected remedy. The contingency plan should be flexible enough to allow for incorporation of new information about site risks and technologies. DOE, EPA and UDEQ will jointly determine the need for and the appropriate contingency action based on an analysis of monitoring results (see Section 11.5 and Appendix B of the ROD). The contingency plan as defined by Section 11.5 of the ROD is as follows:

> The Remedial Investigation Addendum/Focused Feasibility Study (DOE 2004c) identified numerous remedies in addition to those which were presented in the Proposed Plan for the Monticello Mill Tailings Site, Operable Unit III, Surface Water and Ground Water, Monticello, Utah (DOE 2003b). The Proposed Plan identified alternative remedies based on the existing set of conditions. Should the remedy not behave as predicted, or not be meeting goals, other remedies may be more appropriate for differing conditions. In the unlikely event that remediation goals will not be achieved within the acceptable time frame, DOE, EPA, and UDEQ will evaluate the need for further action and/or consider the following contingency actions which were described in the Remedial Investigation Addendum/Focused Feasibility Study (DOE 2004c).
>
> - Treatment of the ground water plume by enhancing the effectiveness of the existing permeable reactive barrier. Pump-and-treat enhancement or in situ enhancement has been identified as potential options for this contingency. Section 5.6.4 of the Remedial Investigation Addendum/Focused Feasibility Study (DOE 2004c) discusses these options.
> - Relocation and construction of a PRB at a location hydraulically downgradient of the existing permeable reactive barrier to intercept and treat contaminated ground water in the plume.
>
> Other contingencies could be implemented if conditions change to the extent that a more aggressive treatment alternative is required. Potential remedial alternatives were described in the Remedial Investigation Addendum/Focused Feasibility Study (DOE 2004c). Depending on the nature of future potential problems, the following remedies may be implemented:
>
> - Treatment of hot-spot ground-water extraction (small-scale pump and treat) with evaporative treatment using an existing pond located at the DOE repository site; and if necessary,
> - Pumping (utilizing either wells or trenches) of the contaminated ground-water plume downgradient of the PRB will be considered together with evaporative treatment.
>
> Technologies not available at the time this ROD was developed will also be evaluated in the event that the selected remedy fails to achieve the remediation goals within an acceptable time frame. In all the previously described instances, the existing institutional controls and the monitoring plans would be continued until the remediation goals were met.

3.0 Basis for the Document

According to ROD-specified performance criteria, DOE recognizes that the selected remedy, MNA with institutional controls, is progressing more slowly than expected; water quality restoration to remediation goals is not likely within the predicted 42-year time period. A report entitled *Monticello Mill Tailings Site OU III Analysis of Uranium Trends in Ground Water* was prepared in August 2007 pursuant to the *Monticello Mill tailings Site Operable Unit III Post Record of Decision Monitoring Plan* (August 2004) for OU III. The report indicates that in some portions of the contaminated alluvial aquifer remediation goals will not be met in the overall 42-year period predicted by the model and may require more than 100 years to meet the remediation goals. This was also recognized in annual ground water reports since 2006. Therefore, and in accordance with the ROD contingency plan, DOE, with EPA and UDEQ concurrence, proposes to implement the pump-and-treat contingency remedy.

Additional supporting information for this approach is provided in the most recent CERCLA 5-year review completed in June 2007, which concluded that the remedy remains protective of human health, recognized an elevated risk to ecological receptors, determined that the newly adopted uranium surface water standard did not affect the protectiveness of the selected remedy, and acknowledged that ground water restoration is progressing more slowly than expected. The institutional controls portions of the selected remedy will remain in place as described in the 2004 ROD to ensure continued protectiveness of human health. The post-ROD monitoring plan will be augmented with additional data collection and analysis during the current CERCLA 5-year review period to evaluate whether MNA remains a viable remedy for the site and to evaluate the need for other action. Other actions may include a different feasible remedial technology, consistent with the Contingency Plan described in Section 11.5 of the 2004 ROD, or a technical impracticability waiver if the studies indicate remedial action objectives cannot be met in a reasonable time frame.

Components of the contingency remedy are as follows:

- A pump-and-treat enhancement installed near the PRB as part of a DOE Office of Legacy Management and EPA treatability study will become a component of the contingency remedy for OU III. The contingency remedy evaluation will include operation of the pump-and-treat enhancement upgradient of the existing PRB to evaluate the potential long-term effect of active restoration in reducing contaminant mass and achieving applicable or relevant and appropriate requirements (ARARs). This treatment enhancement may include evaporative treatment and continued treatment with the existing ex situ treatment cells. The treatment will continue until remedial action objectives are met or another remedy is selected. DOE recently met all substantive requirements allowing discharge of treated ground water directly to Montezuma Creek.

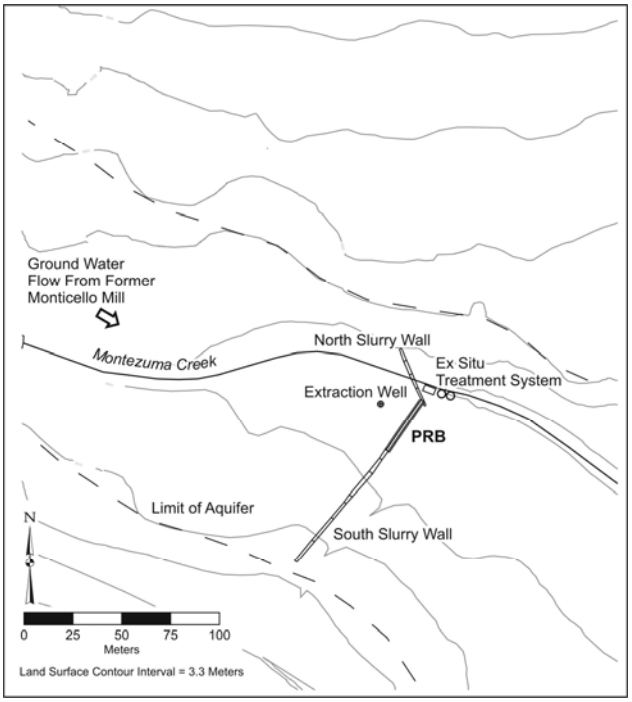

Figure 2. Treatment System Location

- The PRB wall, or a replacement facility that will continue to capture ground water if DOE decides to go forward with decommissioning of the permeable reactive gate, will become part of the remedy. The PRB was designed to allow ground water to flow through and immobilize uranium and other contaminants on zero-valent iron, the reactive medium. However, mineralization within the PRB has significantly reduced its capacity to transmit ground water. To date, the PRB is serving as a barrier to ground water migration and is part of the overall strategy to capture and treat the ground water. DOE will pursue aquifer dewatering using the pump-and-treat enhancement to reduce ground water mounding in preparation for PRB removal.
- The remedial action objectives are modified to include the MCL for uranium in surface water. Table 1 shows a complete listing of the cleanup levels and the basis for the levels. DOE will add surface water monitoring locations downgradient of the ground water plume to further evaluate compliance with surface water standards.

Evaluation and Monitoring:

While these activities are being addressed, DOE will proceed with monitoring (semiannual water quality and hydrologic monitoring) and progress evaluations (annual reporting) as prescribed in the *Monticello Mill Tailings Site Operable Unit III Post-Record of Decision Monitoring Plan*. The State Engineer's Office and DOE will continue to implement and enforce the Ground Water Management Area, an institutional control that restricts use of ground water and construction of wells in the contaminated alluvial aquifer.

To better assess whether the contingency remedy can be effective at the site, it is necessary to understand why MNA has not been proceeding as predicted. Further study will include refined field delineation of ground water contamination "hot spots" (for example, the region from the

PRB south slurry wall west to the former Acid Pile area); reevaluation of site-specific contaminant transport properties (for example, uranium sequestration in mineral phases or organic deposits, and uranium desorption behavior); and reevaluation of the site conceptual and numerical models of ground water flow and solute transport based on new information or concepts. These activities and studies will be conducted during the current CERCLA 5-year review period to further assess and evaluate if MNA will achieve the remedial action objectives.

DOE will use analysis of existing data together with collection and analysis of new data to evaluate in greater detail the factors affecting MNA progress at the site to determine if pump-and-treat enhancement of the ground water together with MNA processes will meet the cleanup levels in a reasonable time frame consistent with the nine CERCLA criteria outlined in the NCP. In addition, cost and risk reduction associated with long-term pump-and-treat enhancement will be reevaluated.

The evaluation and monitoring will enable DOE, in concurrence with EPA and UDEQ, to determine if meeting ground water remediation goals is feasible with MNA alone or whether using pump-and-treat enhancement (e.g., the ex situ treatment cells) together with ground water containment is necessary to meet the remedial action objectives. If meeting remedial action goals is recognized as infeasible, DOE, EPA, and UDEQ agree that petitioning for ARAR waivers based on technical impracticability will be appropriate. If it becomes necessary to select a revised remedy, it is anticipated that a ROD amendment, consistent with the nine CERCLA criteria as part of the NCP, will be issued, subject to public participation as described in CERCLA.

Cost of Remedy

OU III, which addresses surface water and ground water at the Monticello site, has consumed $300,000 to $350,000, respectively, of the total annual budget for the Monticello site since 2005. The implementation of the new contingency remedy would increase this amount approximately $75,000. This is assuming the Grand Junction repository continues to accept material. If a private disposal facility has to be used to dispose of exhausted zero-valent iron media from the ex situ treatment cells, this could increase the annual budget by approximately $50,000.

The implementation of the contingency action and the identification of studies necessary to document the MNA remedy will be documented in a ground water compliance plan to be included as an appendix to Section 5.0 of the Monticello Site Management Plan. As components of the plan are completed, DOE will document the findings in the annual ground water reports and, to a less detailed extent, in the annual Site Management Plan updates.

4.0 Support Agency Comments

EPA and UDEQ concur with the proposed ESD and the implementation of active pump-and-treat enhancement together with MNA as a contingency remedy for OU III. The pump-and-treat enhancement shall continue until the MCLs are met in the plume upgradient of the existing PRB and slurry walls or until DOE, EPA, and UDEQ concur on another remedy.

The remedial design and remedial action plan for the decommissioning of the PRB are subject to approval by EPA and UDEQ. Before decommissioning of the PRB, DOE will be required to reduce the mounding of ground water upgradient of the PRB. The decommissioning plan will include provisions for replacement of the reactive barrier wall with a system that will provide for continued containment and treatment of contaminated ground water upgradient of the PRB until the remedial action objectives are met or until a new or revised remedy is implemented.

5.0 Statutory Determinations

The revised remedy complies with the statutory requirements of CERCLA Section 121, which are to protect human health and the environment, comply with ARARs, be cost effective, utilize permanent solutions and alternate treatment technologies to the maximum extent practicable, and satisfy the preference for treatment as a principal element of the remedy.

6.0 Public Participation Compliance

DOE published a notice in two San Juan County newspapers that described the rationale and content of this ESD and its availability for review as required by NCP Section 300.435(c)(2)(i). The public notice also includes notice of the relocation of the information repository and administrative record at DOE's Grand Junction office. While a formal public comment period is not required when issuing an ESD, DOE will provide for a 30 day public comment period. The 30 day comment period will commence on a date published in a notice in the local newspaper. Interested parties will also be notified by letter.

RESERVED FOR PUBLIC COMMENT

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_____ _____

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Deputy Director of Office of Legacy Management

State of Utah, Department of Environmental Quality

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